Unit 1

Forestry

PART A

TEXTS

Passage 1

What Is a Forest?

Although a forest is usually defined by the presence of trees, under many definitions an area completely lacking trees may still be considered a forest if it grew trees in the past, will grow trees in the future, or was legally designated as a forest regardless of vegetation type. The number of trees in the world, according to a 2015 estimate, is 3 trillion, of which 1.4 trillion are in the tropics or sub-tropics, 0.6 trillion in the temperate zones, and 0.7 trillion in the coniferous boreal forests. The estimate is about eight times higher than previous estimates, and is based on tree densities measured on over 400,000 plots. It remains subject to a wide margin of error, not least because the samples are mainly from Europe and North America.

Forests can also be classified according to the amount of human alteration. Old-growth forest contains mainly natural patterns of biodiversity in established seral patterns, and they contain mainly species native to the region and habitat. In contrast, secondary forest is regrowing forest following timber harvest and may contain species originally from other regions or habitats.

Different global forest classification systems have been proposed, but none has gained universal acceptance. UNEP-WCMC's forest category classification system is a simplification of other more complex systems (e.g. UNESCO's forest and woodland "subformations"). This system divides the world's forests into 26 major types, which reflect climatic zones as well as the principal types of trees. These 26 major types can be reclassified into 6 broader categories: temperate needleleaf; temperate broadleaf and mixed; tropical moist; tropical dry; sparse trees and parkland; and forest plantations. Each category is described as a separate section below.

Temperate needleleaf forests mostly occupy the higher latitude regions of the Northern Hemisphere, as well as high altitude zones and some warm temperate areas, especially on nutrient-poor or otherwise unfavourable soils. These forests are composed entirely, or nearly so, of coniferous species (Coniferophyta). In the Northern Hemisphere pines Pinus, spruces Picea, larches Larix, firs Abies, Douglas firs Pseudotsuga and hemlocks Tsuga, make up the canopy, but other taxa are also important. In the Southern Hemisphere, most coniferous trees (members of the Araucariaceae and Podocarpaceae) occur in mixtures with broadleaf species, and are classed as broadleaf and mixed forests.

Temperate broadleaf and mixed forests include a substantial component of trees in the Anthophyta. They are generally characteristic of the warmer temperate latitudes, but extend to cool temperate ones, particularly in the southern hemisphere. They include such forest types as the mixed deciduous forests of the United States and their counterparts in China and Japan, the broadleaf evergreen rainforests of Japan, Chile and Tasmania, the sclerophyllous forests of Australia, central Chile, the Mediterranean and California, and the southern beech Nothofagus forests of Chile and New Zealand.

There are many different types of tropical moist forests, with lowland evergreen broad leaf tropical rainforests, for example, várzea and igapó forests and the terra firma forests of the Amazon Basin; the peat swamp forests, dipterocarp forests of Southeast Asia; and the high forests of the Congo Basin. Seasonal tropical forests, perhaps the best description for the colloquial term "jungle", typically range from the rainforest zone 10 degrees north or south of the equator, to the Tropic of Cancer and Tropic of Capricorn. Forests located on mountains are also included in this category, divided largely into upper and lower montane formations on the basis of the variation of physiognomy corresponding to changes in altitude.

Tropical dry forests are characteristic of areas in the tropics affected by seasonal drought. The seasonality of rainfall is usually reflected in the deciduousness of the forest canopy, with most trees being leafless for several months of the year. However, under some conditions, e.g. less fertile soils or less predictable drought regimes, the proportion of evergreen species increases and the forests are characterized as "sclerophyllous". Thorn forest, a dense forest of low stature with a high frequency of thorny or spiny species, is found where drought is prolonged, and especially where grazing animals are plentiful. On very poor soils, and especially where fire or herbivory are recurrent phenomena, savannas develop.

Sparse trees and savanna are forests with lower canopy cover of trees. They occur principally in areas of transition from forested to non-forested landscapes. The two major zones in which these ecosystems occur are in the boreal region and in the seasonally dry tropics. At high latitudes, north of the main zone of boreal forest, growing conditions are not adequate to maintain a continuous closed forest cover, so tree cover is both sparse and discontinuous. This vegetation is variously called open taiga, open lichen woodland, and forest tundra. A savanna is a mixed woodland grassland ecosystem characterized by the trees being sufficiently widely spaced so that the canopy does not close. The open canopy allows sufficient light to reach the ground to support an unbroken herbaceous layer consisting primarily of grasses. Savannas maintain an open canopy despite a high tree density.

Forest plantations are generally intended for the production of timber and pulpwood. Commonly mono-specific and/or composed of introduced tree species, these ecosystems are not generally important as habitat for native biodiversity. However, they can be managed in ways that enhance their biodiversity protection functions and they can provide ecosystem services such as maintaining nutrient capital, protecting watersheds and soil structure, and storing carbon.

(Adapted from https://en.wikipedia.org/wiki/Forest)

Passage 2

Global Forest Resources Assessment

The Global Forest Resources Assessment (FRA) compiles and analyses forestry data provided by countries and published every 5-10 years since 1948. A user survey was launched in 2012, where FRA users indicated they are keenly interested in forest area and forest area change. Specifically they are keen to understand natural forest and planted forest area dynamics, to get a perspective on production and conservation. There is strong interest in not only understanding past forest change, but also having an informed view of what changes are likely to occur in forest area and what the impacts of these changes will be on production forestry and forest conservation. An improved understanding of these processes is key to the formulation and implementation of effective policies like Reducing Emissions from Deforestation and forest Degradation (REDD).

Forests are dynamic and forest areas reported by countries to the FRA only give us a snapshot, or a time series of snapshots, which is very useful but inevitably gives an incomplete picture of forests and their dynamics. Forest gain or loss obtained by comparing forest areas over time, gives the balance of a series of processes increasing and decreasing forest. An increase in forest area can happen in two ways, either through afforestation (i.e. planting of trees on land that was not previously forested) or through natural expansion of forests. Reforestation doesn't result in change of forest area following the FAO definition of forest. A reduction in forest area can happen either through natural disasters (where the area is incapable of regenerating within a reasonable time span) or through deforestation (i.e. human induced forest clearing where the land is converted into another use). Deforestation is by far the larger of these two processes reducing forest area.

FRA 2010 (FAO 2010a) provided estimates of deforestation or gross forest loss by subtracting reported afforestation and natural expansion from reported net change to calculate implied deforestation. There are a number of issues related to this approach. One is the lack of information; only 159 out of 233 countries reported afforestation and even fewer were able to report on natural expansion. The other is related to reliability of reported data.

A more accurate estimate of the global forest area and its dynamics is given by the FRA's global remote sensing survey (RSS) undertaken by FAO, its member countries, the EC Joint Research Centre (JRC) and other partners since 2008 (FAO & JRC, 2012). The RSS uses a systematic sampling design with 10 km x 10 km sample plots on each longitude and latitude intersection, providing a sampling intensity of about 1 percent of the global land surface. The RSS found significant net gains in forest area in the boreal (0.9 million ha/year), subtropical (1.1 million ha/year) and temperate domain (0.9 million ha/year) between 1990 and 2005. In contrast, the tropical domain had a net loss of forest area of 6.8 million ha/year for that same period, nearly 2.5 times the net forest area gained in the other three domains combined (FAO & JRC, 2012).

Deforestation is the result of many processes driven by multiple causes. We can distinguish between underlying causes and direct causes of land conversion, referred to as "drivers and pressures" by Smith *et al*. (2010) or "proximate and underlying causes" by Geist and Lambin

(2001). Underlying causes (e.g. societal trends, socio-economic and technology factors) determine the degree of direct causes (e.g. conversion to cropland, clear-cut for logging) resulting in landuse change. The character of deforestation varies by geopolitical location. FRA's pan-tropical remote sensing survey analyzing forest area change showed that in Africa direct conversion of forest area to small-scale agriculture was the most important land change process over the period 1980–2000 (56% of total area change), while in Latin America direct conversion of forest area to large-scale agriculture was most important for that period (41% of total area change). In Asia the share of processes contributing to total area change was more evenly spread, and compared to the other regions the most striking difference is the greater importance of intensification of agriculture in shifting cultivation areas (21% of total area change against 7% in Africa and 3% in Latin America). Though this analysis helps us to characterize deforestation, it doesn't directly quantify the causes of forest loss.

Kissinger *et al*. (2012) do quantify the importance of drivers of deforestation by region from information reported by countries in their REDD+ Readiness Preparation Proposals (RPPs), which in most cases concerns estimates. According to their estimations between 70-80% of forest loss is converted into agriculture in Africa, around 70% in (sub) tropical Asia and >90% in Latin America, though no distinction is made between conversion to cropland and pasture land. A 2006 FRA working paper combining FAOSTAT data interpretation and expert estimation, estimates that at the global scale 75% of foregone forest is converted into cropland, 23% is converted into grassland and woodland (presumably driven by pasture extension and forest degrading activities/natural events), and 1-2% into urban land (Holmgren, 2006). Apart from conversion to agriculture, other commonly referred direct causes of forest loss are forest clearing for wood (including fuelwood overharvesting), expansion of urban areas, infrastructure and mining, and irreversible damage by natural causes (Holmgren, 2012; Smith *et al*., 2010). Kissinger *et al*. (2012) do not mention any timber logging or fuelwood collection as driving deforestation though they do quantify them as the most important drivers of forest degradation in the three continents.

(Adapted from Forest Resources Assessment Working Paper 182, FRA 2015, *Forest Futures Methodology,* FAO)

Passage 3

Challenges and Opportunities for Forests

Forests are under significant threat. Population growth, along with changes in consumption patterns in middle-income countries, has generated a boom in the demand for food, fiber, energy, and minerals, which in turn exacerbates pressures on natural forests. Although the pace of global deforestation has slowed since the 1990s, it remains high: about 13 million hectares (gross) were converted annually to other uses such as agriculture, infrastructure development, and oil and mineral extraction, or were lost through natural causes—in many cases exacerbated by climate change—between 2000 and 2010. During the same period, reforestation partially offset these losses, reducing annual net forest loss to 5.6 million hectares. But this still amounts to a loss of forest area larger than the size of Costa Rica each year (FAO, 2014). Furthermore, as much as 40 million hectares of primary forests were converted to secondary forests. With concerted action, society could make significantly improved and long-lasting use of global forest resources for poverty eradication and sustainable economic development. Although forests still face major challenges, opportunities have emerged that could transform the way they are managed.

Climate Change

Challenge

The current and projected impacts of climate change, including but not limited to rising temperatures and increasingly unpredictable precipitation patterns, increase the vulnerability of forests to pests, diseases, and fires. At the same time, forest loss affects water cycles on a large scale and can put water supplies and food security at risk.

Opportunity

Forests and their biodiversity make a crucial contribution to mitigating the impacts of climate change not only by absorbing GHGs from the atmosphere, but also by regulating water flows, protecting coastal communities from extreme events and sea level rise, and offering plant and animal species migratory corridors to more suitable habitats. Forests and trees are the cornerstone of the land restoration agenda: some two billion hectares of lost or degraded forests and landscapes could be restored and rehabilitated to functional and productive ecosystems. Essential to this process is the restoration of the biodiversity within forest systems, which is the backbone of a healthy ecosystem. The restoration of ecosystems and their biodiversity would generate increased economic opportunities in rural areas, deliver improved rural livelihoods and food security, help fill household energy gaps as a renewable energy source, enhance climate resilience, and mitigate GHG emissions while taking pressure off pristine forests.

Competing Uses of Land

Challenge

For a long time, the default development path for forest-rich nations has been to convert natural forests into agricultural or other land uses. This development model is usually referred to as the "forest 10 World Bank Group Forest Action Plan FY16-20 transition theory", holding that economic growth goes hand in hand with deforestation (Mather, 1992). This theory is now questioned, however, and some countries, such as Brazil, show that the curves of deforestation and economic growth can be decoupled, and that increased agricultural value does not have to come at the expense of forests.

Opportunity

A forest-smart, multisector or landscape approach considers forests and the services they provide to be key elements of the Sustainable Development Agenda. This translates into decisions on land use that seek to minimize or mitigate negative impacts on forests and enhance their positive contributions to other sectors. Greater attention to the role of forests in national development strategies can provide benefits for longterm food security, poverty reduction, social development, and green growth. Data and information on the long-term impacts of potential decisions on forests can inform discussions on trade-offs in land use planning.

Growing Demand for Forest Products

Challenge

Demand for timber products is growing rapidly, with the demand for global industrial roundwood predicted to quadruple by 2050 (Indufor, 2012). This increase surpasses by a large amount the supply growth, deepening the projected yearly supply deficit from one billion cubic meters in 2012 to 4.5 billion cubic meters in 2050. This rising global demand for timber and other forest products risks fueling unsustainable and often illegal timber trade flows. Planted forests can represent a promising option to fill the gap in timber supply. However, poorly designed planted forests can lead to the degradation of critical ecosystems, erosion of the ecological services delivered by these ecosystems, and lack of respect for the rights and interests of local communities.

Opportunity

Since 2000, the area of planted forests has increased considerably. Planted forest area now accounts for around 7 percent of the total area of global forests—some 280 million hectares. The area continues to increase at a rate of around five million hectares per year, through afforestation as well as managed natural regeneration. The expansion of planted forests is largely driven by the private sector. Carefully designed and managed planted forests can present major opportunities for job creation and sustainable economic growth in rural areas. Certification schemes as well as new models (such as the New Generation Plantations) are paving the way for responsible investments in the sustainable management of forests—natural and planted—in southern countries.

Forest Governance

Challenge

Estimates indicate that industrial hardwood timber of questionable origins might constitute 23-30 percent of global supply, and the availability of illegal supply depresses prices by 7-16 percent. Illegal logging on public lands results in estimated losses in assets and revenue in excess of $10 billion annually. Because of its value and scale, illegal logging is also a driver of wider systemic corruption and can fuel conflicts and threaten security.

Opportunity

Progress has been made over the past 10 years in tackling illegal logging, resulting from a combination of actions taken at the international and national levels to monitor and track illegal activities. However, forest governance requires continuous efforts to tackle emerging challenges through policy changes, strengthened institutions, and enhanced monitoring systems. New information and communications technologies (ICTs) provide opportunities to monitor forest cover in almost real-time, allowing for the detection of fires and deforestation hotspots. Timber can now be tracked all along the supply chain, and public participation is enhanced through open data applications (such as e-government and open government).

Private Financing for Sustainable Forest Management

Challenge

The required funding for sustainable forest management is estimated to be between $70 billion and $160 billion per year globally (World Bank, 2014). The amount needed to supply the world's need for wood products alone is about $50 billion. Mobilization of adequate financing for the forest sector remains a challenge. Private financial flows to this sector are estimated to be as high as $15 billion per year (Asen, Savenije, and Schmidt, 2012). Although private financing is promising, it is not yet distributed evenly across regions, and the potential in many developing countries has yet to materialize.

Opportunity

Increased investments in plantations are expected to go to emerging and developing countries. This represents a shift in this industry, where historically private investment in timber production and processing has been concentrated in high-income countries. Some countries in Latin America have significantly increased their plantation area over the past decade, but opportunities exist in other regions, particularly in Africa. There is tremendous potential to unlock the investment of responsible private operators in sustainable forest management and forest product value chains in emerging and developing countries. This will require a robust regulatory framework that ensures that forest investments are done in an environmentally friendly and socially responsible way.

Rights over Forests

Challenge

The widespread pressures on natural forests—human-made (for example, incursions by loggers and deforestation) or natural (for example, droughts or fires induced by climate change)—have increased the vulnerability of indigenous peoples and other traditional-living rural populations, by jeopardizing their secured access to forest lands and resources. Where the state has asserted its rights to land and forests and subsequently chosen to allocate these rights to investors in the forest or other sectors, conflicts with indigenous peoples and local communities that have long depended on these areas have escalated.

Opportunity

In the past decades, there has been a trend toward more community involvement in decision-making processes related to the use of forests. Research shows that decentralization of the use and ownership of forests and trees to local communities improves forest conservation and management, with significant productivity and yield increases (RRI, 2014). Local control over resources and community-based forest management also offer opportunities to reduce poverty among forest-dependent households.

(Adapted from World Bank Group FY 2016–2017 Forest Action Plan, http://documents.worldbank.org/curated/en/240231467291388831/pdf/106467-REVISED-v1-PUBLIC.pdf)

PART B

VOCABULARY

Match the words with their definitions according to the context.

Passage 1

______ 1. habitat — a. natural height (as of a person) in an upright position

______ 2. canopy — b. the process or a period of changing from one state or condition to another

______ 3. prolonged — c. important

______ 4. stature — d. the place or environment where a plant or animal naturally or normally lives and grows

______ 5. recurrent — e. of few and scattered elements

______ 6. counterpart — f. a protective covering: such as the uppermost spreading branchy layer of a forest

______ 7. sparse — g. one remarkably similar to another

______ 8. transition — h. occurring often or repeatedly

______ 9. fertile — i. extended in duration

______ 10. substantial — j. producing or bearing many crops in great quantities

Passage 2

______ 1. perspective — a. basic or fundamental

______ 2. conservation — b. dependability

______ 3. domain — c. a mental view or prospect

______ 4. compile — d. that cannot be changed back to what it was before

______ 5. underlying — e. an area of territory owned or controlled by a ruler or government

______ 6. convert — f. a careful preservation and protection of something

______ 7. striking — g. to compose out of materials from other documents

______ 8. reliability — h. to change from one form or function to another

______ 9. irreversible — i. to cut (trees) for lumber

______ 10. log — j. attracting attention or notice through unusual or conspicuous qualities

Passage 3

______ 1. exacerbate — a. the falling to earth of any form of water (rain or snow or hail or sleet or mist)

_______ 2. concerted b. strong and healthy
_______ 3. eradication c. to restore to a former capacity
_______ 4. precipitation d. to make (a problem, bad situation, or negative feeling) worse
_______ 5. mitigate e. native
_______ 6. rehabilitate f. jointly arranged, planned, or carried out
_______ 7. trade-offs g. to increase in extent, volume, number, amount, intensity, or scope
_______ 8. robust h. the complete destruction of something
_______ 9. escalate i. to make less severe, serious, or painful
_______ 10. indigenous j. a balancing of factors all of which are not attainable at the same time

PART C

ACADEMIC READING SKILLS

Skimming and Scanning

Skimming is to look for the general idea of the text. When you skim, you move your eyes quickly over the reading text, looking for the main idea rather than the details, so as to maintain the maximum reading speed. The following steps for skimming are suggested:

a. Read the title.
b. Read the author's name and the source of the text.
c. Read any subheadings.
d. Read the introduction paragraph(s).
e. Read the first sentence of each paragraph.
f. Read the last paragraph if it appears to be a summary.

Besides, to read a passage, it is helpful to think a bit ahead of what you are reading. You can use information from a text, including titles, headings, pictures, and diagrams, etc. and your own personal experiences to predict what is going to happen next.

Scanning is looking for the exact answer to a specific question. When you scan, you let your eyes run quickly over several lines of the text at a time, looking for a specific fact or information with speed and accuracy. The following steps for scanning are suggested:

a. Be sure to know what you want to find.
b. If you are not familiar with the material, find out its structure. If necessary, skim and locate the section of the material that may contain the information you need.
c. Move your eyes rapidly over the lines until you find the very information you want.